

CLAIMS

I CLAIM:

1. Apparatus for measuring ventilation of a body having a surface that moves in response to the ventilation comprising:
 - a first permanent magnet;
 - a first magnet attachment mechanism configured to attach the first magnet to the surface;
 - a first magnetic sensor having an output;
 - a first sensor attachment mechanism configured to attach the first sensor to the surface; and
 - a processing system configured to communicate with the magnetic sensor and to determine the ventilation based on the output of the magnetic sensor.
2. The apparatus of Claim 1 further including:
 - a second permanent magnet; and
 - a second magnet attachment mechanism configured to attach the second magnet to the surface.
3. The apparatus of Claim 2 wherein the strength of the first and second magnets are different.
4. The apparatus of Claim 1 further including:
 - a second magnetic sensor; and
 - a second sensor attachment mechanism configured to attach the second sensor to the surface.
5. The apparatus of Claim 4 wherein the sensitivity of the first and second sensors are different.
6. The apparatus of Claim 1 wherein the magnet attachment mechanism and the sensor attachment mechanism include an adhesive.

7. The apparatus of Claim 1 wherein the magnet attachment mechanism and the sensor attachment mechanism include tape.

8. The apparatus of Claim 1 wherein the magnet attachment mechanism and the sensor attachment mechanism include a strap.

9. The apparatus of Claim 1 further including:

a first electrode wherein the magnet attachment mechanism is also configured to attach the first electrode and the magnetic to the surface at substantially the same time; and

a second electrode wherein the sensor attachment mechanism is configured to attach the second electrode and the sensor to the surface at substantially the same time.

10. The apparatus of Claim 9 wherein the first and second electrodes are configured to operate with an electrocardiograph.

11. The apparatus of Claim 9 wherein:

the magnet and the first electrode are affixed to the magnetic attachment mechanism; and

the sensor and the second electrode are affixed to the sensor attachment mechanism.

12. A process for measuring ventilation of a body having a surface that moves in response to the ventilation comprising:

affixing a first permanent magnet to a first location of the surface;

affixing a first magnetic sensor having an output to a second location on the surface that is different from the first location; and

processing the output of the first sensor to determine the ventilation.

13. The process of Claim 12 further including affixing a second magnetic sensor to a third location of the surface.

14. The process of Claim 12 further including affixing a second permanent magnet to a third location of the surface.
15. The process of Claim 14 wherein the surface includes a chest, abdomen and back and wherein the first location is on the chest, the second location is on the back, and the third location is on the abdomen.
16. The process of Claim 15 wherein the relative strengths between the magnetic fields from the first and second magnets at the location of the sensor are correlated to the amounts by which the abdomen and chest move during the ventilation.
17. The process of Claim 16 further including an adjustment to achieve the relative strengths.
18. The process of Claim 17 wherein the adjustment is to the location of the first or second magnet on the surface.
19. The process of Claim 17 wherein the adjustment is to the location of the sensor on the surface.
20. The process of Claim 17 wherein the adjustment is to strength of the first or second magnet.
21. The process of Claim 14 wherein the first and second magnets each have a set of poles and wherein the sets of poles are oriented in substantially the same direction.
22. The process of Claim 14 wherein the first and second magnets each have a set of poles and wherein the sets of poles are oriented in substantially the opposite direction.
23. The process of Claim 12 wherein the angular position of the magnet relative to the sensor is such as to substantially maximize changes in the output from the sensor caused by corresponding changes in the distance between the magnet and the sensor.
24. The process of Claim 12 further including:

attaching a first electrode to the surface at substantially the same time as the magnet is attached to the surface; and

attaching a second electrode to the surface at substantially the same time as the sensor is attached to the surface.

25. The process of Claim 24 wherein the first and second electrodes each have an output and further including processing the output of the first electrode and the output of the second electrode as part of the production of an electrocardiogram.

26. The process of Claim 25 wherein the ventilation is determined at substantially the same time as the electrocardiogram is produced.

27. Apparatus for measuring ventilation of a body having a surface that moves in response to the ventilation comprising:

a first permanent magnet attached at a first location to the surface;

a magnetic sensor attached at a second location to the surface that is different from the first; and

a processing system configured to communicate with the magnetic sensor and to determine the ventilation based on the output of the magnetic sensor.

28. The apparatus of Claim 27 further including a second permanent magnet attached at a third location to the surface that is different from the first and the second location.

29. The apparatus of Claim 28 wherein the first and second magnets each have a set of poles and wherein the set of poles are oriented in substantially the same direction.

30. The apparatus of Claim 29 wherein the first and second magnets each have a set of poles and wherein the set of poles are oriented in substantially the opposite direction.

31. Apparatus for measuring the change in the volume of a body part having a surface that moves in response to the change comprising:

a permanent magnet;
a magnet attachment mechanism configured to attach the magnet to the surface;
a magnetic sensor having an output;
a sensor attachment mechanism configured to attach the sensor to the surface; and
a processing system configured to communicate with the magnetic sensor and to determine the change in volume based on the output of the magnetic sensor.

32. A process for measuring the change in the volume of a body part having a surface that moves in response to the change comprising:

affixing a permanent magnet to a first location of the surface;
affixing a magnetic sensor having an output to a second location on the surface that is different from the first location; and
processing the output of the sensor to determine the ventilation.

33. A biomedical sensor for use in connection with a body having a surface comprising:

a permanent magnet;
an electrode; and
an attachment mechanism configured to attach the electrode and the magnet to the surface at substantially the same time.

34. A biomedical sensor for use in connection with a body having a surface comprising:

a magnetic sensor;
an electrode; and
an attachment mechanism configured to attach the electrode and the sensor to a first area of the surface at substantially the same time.

35. A biomedical sensor for use in connection with a body having a surface comprising:

- a first permanent magnet;
- a first electrode;
- a first attachment mechanism configured to attach the first electrode and the first magnet to the surface at substantially the same time;
- a first magnetic sensor;
- a second electrode;
- a second attachment mechanism configured to attach the second electrode and the first sensor to a second area of the surface at substantially the same time;
- a second permanent magnet or second magnetic sensor;
- a third electrode; and
- a third attachment mechanism configured to attach the third electrode and the second magnet or the second sensor to a third area of the surface at substantially the same time.